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**APPLICATION
FOR
UNITED STATES LETTERS PATENT**

Title: NMEA 0183 SENTENCE TRANSPORTER OVER ETHERNET

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NMEA 0183 SENTENCE TRANSPORTER OVER ETHERNET

Field of the Invention:

The present invention relates to the transmission of NMEA 0183 sentence data and, more particularly, to transmitting this NMEA 0183 data over the Ethernet while allowing for complete transparency to the user's equipment, and to the software applications needing access to NMEA 0183 sentence data.

BACKGROUND OF THE INVENTION

NMEA 0183 is a standard data sentence format designed to enable various manufacturers of navigation equipment and software to share data. This is the most used format world-wide for the sharing of data such as latitude, longitude, depth, winds, waypoints, heading, data/time, speeds, etc. Standard NMEA 0183 sentence data transmission is defined as 4800 baud, transmitting over the RS422 electrical standard. This slow speed of

transmission of data from the NMEA navigation devices is restrictive to today's needs. Multiple listeners (Navigation Devices) are limited to three users. Multiple COM ports on personal computers must be reserved for each NMEA 0183 transmitting device which increases costs and complexity.

Hardware NMEA 0183 multiplexors are limited to the number of inputs that they can support, are not Ethernet compatible and have potential buffer over runs as a result of the restriction of the 4800 baud on outputs.

It is therefore an object of the invention to increase the transmission speed of the NMEA 0183 data from its present speed of 4800 baud to the high speed of the Ethernet.

It is another object of the invention to provide for dynamic routing and identification of this NMEA 0183 data by encapsulating of NMEA 0183 sentences with a

proprietary header.

It is another object of the invention to provide a software utility that is the bridge between the Ethernet NMEA 0183 sentence data and the user applications which operate on computers, with complete transparency in operation.

It is another object of the invention to allow user configurable parameters of the invention's controller via a software utility.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided an interface controller which adapts the NMEA 0183 sentence data from an RS422 electrical format to the Ethernet. Sentence data is encapsulated and routed to other interface controllers, and/or to user applications operating on computers, via the invention's transparent

utility program. This transparent program provides the interface between the NMEA 0183 sentence Ethernet packet and the user programs by routing the data to Virtual COM ports dynamically created by the utility program, while operating on computers. The GUI (Graphics User Interface) of the utility program allows for user mapping of the Virtual COM ports and the NMEA 0183 sentences, among other user interface options.

BRIEF DESCRIPTION OF THE DRAWINGS

A complete understanding of the present invention may be obtained by reference to the accompanying drawings, when considered in conjunction with the subsequent, detailed description, in which:

Figure 1 is a block diagram showing the components view of an interface controller, the RS422 NMEA 0183 devices and the Ethernet;

Figure 2 is a block diagram of the input process logic view of an interface controller;

Figure 3 is a block diagram of the output process logic view of an interface controller;

Figure 4 is a data packet diagram view of an Ethernet record created by the controller and by the interface utility program on the computer;

Figure 5 is a data element view of an Ethernet packet record field details created by this invention; and

Figure 6 is a block system logic diagram view of a program logic view of the system utility program that interfaces the NMEA 0183 Ethernet packets and the user applications running on the computer.

For purposes of clarity and brevity, like elements and components will bear the same designations and

numbering throughout the FIGURES.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 is a block diagram showing the components comprising the Interface_Controller 39 that is the bridge between the RS422 NMEA_0183_Navigation_Devices 1 and the Ethernet 5. The NMEA_0183_Navigation_Devices 1 are devices that output and receive the standard NMEA_0183_Sentence 20 data structure over a RS422 electrically compatible link. These NMEA_0183_Navigation_Devices 1 , NMEA_0183_RS422_Inputs 6, are interfaced to this controller at the RS422_Transceiver 2 which provides for the electrical compatibility as required by the RS422 standard. This RS422_Transceiver 2 is then electrically coupled to the Microprocessor 3, which processes the NMEA_0183_Data_Sentence 37 received from the RS422_Transceiver 2 and from the Ethernet_NMEA_0183_Data_Packet 38. This Ethernet_NMEA_0183_Data_Packet 38 is handled by the Ethernet_Transceiver 4. This Ethernet_Transceiver 4

provides for the electrical interface requirements as defined for the Ethernet 5. These electrical components are package in a container suitable for the installation location and the environment of the Interface_Controller 39 will be located in. Means shall be provided for the connections to the NMEA_0183_Navigation_Devices 1 electrically, along with electrical and mechanical connection to the the Ethernet 5. In addition, allowances will be made for the connections of AC or DC power required to operate the electronics within the Interface_Controller 39.

Figure 2 is a block diagram of the input process flow view of the Interface_Controller 39. This flow is representative of logic that is programmed into the Microprocessor 3 within the Interface_Controller 39. The flow starts by the receipt of data from the NMEA_0183_Navigation_Devices 1, which is referred to as the NMEA_0183_RS422_Inputs 6. These NMEA_0183_RS422_Inputs 6, of which there can be one or many, are polled in an endless loop by the program logic Poll_RS422_Inputs 7. Poll_

RS422_Inputs 7 checks to see if a complete NMEA_0183_Data_Sentence 37 has been received at this input port. If not, then Poll_RS422_Inputs 7 continues to the next input RS422 port. If the NMEA_0183_Data_Sentence 37 has been completely received, then it is passed to Filter_Packets 8. Filter_Packets 8 then checks its user defined memory variables to see if there are routing instructions for this NMEA_0183_Data_Sentence 37 and if there are other instructions on the handling of this NMEA_0183_Data_Sentence 37. These special handling instructions then are applied by the Add_Prefix 9 program logic to create the resultant Ethernet_NMEA_0183_Data_Packet 38, with the Build_Output_Packet 10 program logic. The Output_Packet 11 program logic takes the Ethernet_NMEA_0183_Data_Packet 38 and writes this data to the Ethernet 5 via the Ethernet_Transceiver 4.

Figure 3 is a block diagram of the output process flow view of the Interface_Controller 39. This logic flow is representative of the logic that is programmed into the Microprocessor 3 within the Interface_Controller

39. The flow starts by the receipt of the Ethernet_NMEA_0183_Data_Packet 38 from the Ethernet 5 at the Ethernet_Transceiver 4. This Ethernet_NMEA_0183_Data_Packet 38 is handled by the Receive_Ethernet_Packet 17 program module. The Ethernet_NMEA_0183_Data_Packet 38 is then passed to the Parse_Packet 16 program module which starts to break apart the data fields. Then the data is passed to the Strip-Headers 15 program module. It is at the Strip-Headers 15 program module that the NMEA_0183_Data_Sentence 37 is returned to its native format. At this stage, the Check_Filters 14 program module, checks the user stored parameters that will allow it to make decisions for the next module which is Route_to_Port 13. The Route_to_Port 13 program module determines which RS422_Transceiver 2 output port to write this NMEA_0183_Sentence 20 as defined by the NMEA_0183_RS422_Outputs 12.

Figure 4 is a packet diagram view of the Ethernet_NMEA_0183_Data_Packet 38 created by the Interface_Controller 39 and/or created by the Software_Interface_

Utility 40. This is comprised of the standard UDP_Header 18, the Ethernet_Header 19 which defines this type of packet of data, the NMEA_0183_Data_Sentence 37 and the Ethernet_Trailer 21. The Ethernet_Trailer 21 will contain any significant makers which might be required to identify the end of the Ethernet_NMEA_0183_Data_Packet 38.

Figure 5 is a generic data element field view of the Ethernet_Header 19 of the Ethernet_NMEA_0183_Data_Packet 38 created by the Interface_Controller 39 and/or created by the Software_Interface_Utility 40. This view provides a general concept of the data fields that will comprise the Ethernet_Header 19 which is prefixed to the NMEA_0183_Data_Sentence 37. The first field is the Ethernet_Identifier 22 followed by the Origin_ID 23 which is the unique identification assigned when the NMEA_0183_Data_Sentence 37 is received. Next is the Destination_ID 24 that defines the port for routing this data packet to. The next two fields IP_Address 25 and Port_Address 26, of the Software_Interface_Utility 40 program that does the

interfacing between the Ethernet_NMEA_0183_Data_Packet 38 are used to further define the routing directions. The last field, Sentence_Codes 27, is the NMEA_0183_Data_Sentence 37 identifier code, which is unique for this NMEA_0183_Data_Sentence 37 and is part of the standard as published by the NMEA organization.

Figure 6 is a block diagram of the the program logic of the Software_Interface_Utility 40 program that does the interfacing between the Ethernet_NMEA_0183_Data_Packet 38 and the User_Applications 32 running on the user's computer. This Software_Interface_Utility 40 will provide a GUI (Graphic User Interface) to the user for configuring and mapping of Virtual_COM_Ports 41 to the User_Applications 32. The Ethernet_NMEA_0183_Data_Packet 38 is handled by the Receive_Packet 28 program routine. The Ethernet_Header 19 is processed by the Check_Header 29 program routine as it checks for information which will set its logic for the mapping and routing of the NMEA_0183_Data_Sentence 37 portion of this Ethernet_NMEA_0183_Data_Packet 38. Then the Strip-Headers_From_Packet

30 separates the Ethernet_NMEA_0183_Data_Packet 38 back to its native form of the NMEA_0183_Data_Sentence 37. The NMEA_0183_Data_Sentence 37 is then passed to the Route_to_Virtual_COM_Port 31 program routine for writing the NMEA_0183_Data_Sentence 37 to the correctly routed Virtual_COM_Ports 41 based upon the instructions in the Ethernet_Header 19.

The Virtual_COM_Ports 41 are also being read by the Software_Interface_Utility 40 while all the time checking for a NMEA_0183_Data_Sentence 37 with the program routine Read_From_Virtual_COM_Port 33 . Once a complete NMEA_0183_Data_Sentence 37 is found, the program routine Check_Routing 34 is invoked to determine how to handle the routing of this NMEA_0183_Data_Sentence 37. The Build-Headers 35 program routine is then used to construct the Ethernet_NMEA_0183_Data_Packet 38 which will be comprised of, but not limited to the UDP_Header 18, Ethernet_Header 19, NMEA_0183_Data_Sentence 37 and the Ethernet_Trailer 21. This completed Ethernet_NMEA_0183_Data_Packet is then passed to the Write_Packet 36 program routine to be

written to the Ethernet 5.

Thus in summary, it can be seen that the Interface_ Controller 39 provides a bridge for the NMEA_0183_ Navigation_Devices 1 which uses the NMEA_0183_Data_ Sentence 37, and the Ethernet 5. While at the users computer, the Software_Interface_Utility 40 provides another bridge between the Ethernet 5 and the User_ Applications 32 which use or create the NMEA_0183_Data_ Sentence 37. In addition, this transports the NMEA_0183_ Data_Sentence 37 at the high speed of the Ethernet 5 while providing transparency to the user.

Since other modifications and changes varied to fit particular operating requirements and environments will be apparent to those skilled in the art, the invention is not considered limited to the example chosen for purposes of disclosure, and covers all changes and modifications which do not constitute departures from the true spirit and scope of this invention.

Having thus described the invention, what is desired to be protected by Letters Patent is presented in the subsequently appended claims.

What is claimed is: